E.P.I.C.
Electronic Precision Instrument Company
10958 SOUTH VERMONT AVE.
LOS ANGELES 44, CALIFORNIA
PLymouth 7-3126

INSTRUCTION BOOK

MODEL 1030 -A-

LOW FREQUENCY "Q" INDICATOR

FREED TRANSFORMER CO. INC.

INSTRUMENT DIVISION

INSTRUCTION MANUAL

E P I C
Service Company
311 NORTH PRAIRIE AVE.
HAWTHORNE, CALIFORNIA
OSborne 9-3960

FREED TRANSFORMER CO., INC.
1718 WEIRFIELD ST., BROOKLYN (RIDGEWOOD) 27, N. Y.

E.P.I.C.
960 O'BRIEN DRIVE
MENLO PARK, CALIF.
DAvenport 4-0[illegible]

E P I C
Service Company
811 NORTH PRAIRIE AVENUE
HAWTHORNE, CALIFORNIA
OSborne 9-3960

Cap. Decade
x 1%

INSTRUCTION BOOK

MODEL 1030 ~~A~~

LOW FREQUENCY "Q" INDICATOR

FREED TRANSFORMER CO. INC.

INSTRUMENT DIVISION

E P I C
Service Company
811 NORTH PRAIRIE AVENUE
HAWTHORNE, CALIFORNIA
OSborne 9-3960

PRELIMINARY INSTRUCTION MANUAL
FREED LOW FREQUENCY "Q" INDICATOR
TYPE NO. 1030-A

USES

THE TYPE 1030-A LOW FREQUENCY "Q" INDICATOR MEASURES DIRECTLY THE "Q" FACTOR OF COILS. THE INSTRUMENT CAN ALSO BE USED TO MEASURE THE INDUCTANCE OF COILS, DISTRIBUTED CAPACITY, IMPEDANCES, AND DIELECTRIC LOSSES. THE "Q" INDICATOR CAN BE USED TO STUDY THE MAGNETIC PROPERTIES OF IRON, SUCH AS STABILITY OF IRON CORES IN FUNCTION OF APPLIED VOLTAGES, AND IRON LOSSES AS A FUNCTION OF THE FREQUENCY.

FEATURES

THE MAIN AND ESSENTIAL FEATURE OF THE INSTRUMENT IS THAT THE "Q" FACTOR IS READ DIRECTLY WITHOUT ANY COMPLICATED COMPUTATIONS. THE POSSIBILITY OF MEASURING "Q" THROUGH THE WHOLE AUDIO AND SUPERSONIC FREQUENCY RANGE IS PROVIDED. THE SETTING UP AND THE MEASURING OF THE "Q" OF COILS IS PRACTICALLY INSTANTANEOUS. THE INSTRUMENT IS UNAFFECTED BY LINE VOLTAGE VARIATIONS AND IS ENTIRELY SELF-CONTAINED AND A.C. OPERATED. BOTH METERS ("MULTIPLY-BY AND "Q") ARE PROTECTED AGAINST OVERLOADS. THE FREQUENCY RANGE FOR "Q" MEASUREMENTS IS FROM 20 TO 200,000 CYCLES/SEC. THE TERMINALS OF THE VARIABLE DECADE CONDENSERS ARE AVAILABLE DIRECTLY ON THE FRONT PANEL OF THE INSTRUMENT. THE CONDENSERS, THEREFORE, CAN BE USED AS HIGH QUALITY PRECISION VARIABLE CONDENSERS. TO REDUCE THE RESIDUAL CAPACITANCE A LINK IS PROVIDED ON THE FRONT PANEL OF THE INSTRUMENT WHICH DISCONNECTS ALL BUT THE 100 MMFD. VARIABLE AIR CONDENSER. WHEN THE LINK IS CLOSED FIVE DECADE CAPACITORS AND THE AIR VARIABLE ARE CONNECTED ACROSS THE CONDENSER TERMINALS. THE R.C. OSCILLATOR AND VARIABLE IMPEDANCE AMPLIFIER CAN BE USED AS A SEPARATE LOW FREQUENCY GENERATOR WITH A MAXIMUM OUTPUT POWER OF EIGHT WATTS INTO A 100 OHM LOAD. THE "Q" SCALE IS CALIBRATED FROM 0 TO 100. A HIGH ACCURACY OF MEASUREMENT IS OBTAINED, SINCE "Q" VARIATIONS FROM 0 TO 100 ARE READ ON A 4 INCH METER. "Q" FACTORS OF COILS CAN BE MEASURED WITH UP TO 100 VOLTS ACROSS THE COIL, AND THEREFORE MAKES IT POSSIBLE TO DETERMINE THE STABILITY AND THE VARIATIONS OF THE "Q" FACTOR OF COILS IN FUNCTION OF THE APPLIED VOLTAGE. THE VOLTAGE FED INTO THE SERIES CIRCUIT IS VARIABLE FROM 10 VOLTS TO .01 VOLT.

SPECIFICATIONS

RANGE OF "Q" MEASUREMENTS- THE RANGE OF "Q" FACTORS IS FROM 0.1 TO 1000 OVER THE FREQUENCY RANGE FROM 20 TO 200,000 CYCLES WITH AN ACCURACY OF 5%

OSCILLATOR FREQUENCY RANGE- CONTINOUSLY VARIABLE FROM 20 TO 200,000 CYCLES IN FOUR RANGES.

FREQUENCY ACCURACY - 1% UNDER NORMAL TEMPERATURE CONDITIONS. THE FREQUENCY STABILITY IS BETTER THAN 2% OVER A LONG PERIOD OF TIME.

E.P.I.C.
960 O'BRIEN DRIVE
MENLO PARK, CALIF.
DAvenport 4-0074

OUTPUT IMPEDANCE AND VOLTAGE - Four output impedances are available.

A) 10 ohms impedance - 10 V Output Voltage
B) 1 ohm impedance - 1 V Output Voltage
C) .2 ohm impedance - .1 V Output Voltage
D) .1 ohm impedance -.01 V Output Voltage

These impedances are measured at 50,000 cycles.

VARIABLE CONDENSER - The variable condenser is composed of a 10 x 1 mfd., 10 x 0.1mfd., 10 x 0.01 mfd., 10 x 0.001 mfd., and 10 x 0.0001 mfd. decade condenser and a 100 mmfd. variable air condenser. The minimum capacity of the unit is approximately 65 mmfd. Opening the link between terminals 5 and 6 disconnects all but the 100 mmfd. capacitor, this reduces the minimum capacity to 25 mmfd.

POWER SUPPLY - The instrument is entirely self-contained and A.C. operated. Total consumption 200 watts.

DIMENSION - 19 1/2" x 14 1/2" x 23"H.

WEIGHT - 120 lbs.

OPERATING CONTROLS

OSCILLATOR CONTROLS

FREQUENCY DIAL - calibrated from 20 to 200 cycles.

FREQUENCY RANGE - multiplier for the frequency dial.

GAIN - this control is used to vary the oscillator output voltage.

METERING CONTROLS

A) "Q Meter" - The Q scale on this meter indicates the "Q" of the coil under test. The voltage scale indicates the voltage across the coil under test, using multipliers as described in B.

B) Range switch for the "Q Meter" multiplier for both Q and voltage readings on meter A.

C) Range switch for "Multiply By" meter and output attenuator for oscillator amplifier as indicated in diagram no. 1.

When the "Multiply By" meter indicates 1 and switch C is in position .01 the voltage being fed into the resonant circuit is 10 volts. The output impedance is 10 ohms.

In position .1 the voltage is 1 and impedance is 1 ohm. In position 1 the voltage is .1 and the impedance is .2 ohms. In position 10 the voltage is .01 and the impedance is .1 ohm.

D) "Multiply By Meter" - This is a multiplier for the Q meter. It indicates oscillator output voltage.

NOTE - Q = A x B x C x D
Voltage across Coil = A x B

OPERATING PROCEDURE

After a five minute warm-up period the instrument is ready for operation. Connect the inductor across terminals 2 and 4, set the frequency dial and range switch to the desired value. Set the "B" switch on the appropriate range depending on the test voltage that is to be applied to the coil. Set the "C" switch and oscillator gain control so that a deflection may be seen on the "Q Meter" (A) and adjust the variable capacitors until A reads a maximum. As a resonance condition is approached the "Q Meter" reading will increase and the C switch and gain control will have to be readjusted to keep the desired test voltage across the coil as indicated on Meter A. Note that terminals 5 and 6 should be shorted unless the capacity needed to resonate the coil is less than 100 mmfd.

CALIBRATION PROCEDURE

Oscillator Frequency - Set the frequency range switch on position 1 and by means of Lissajou patterns set the dial so that the oscillator frequency is 60 cycles. If the dial does not indicate 60 loosen the two allen head screws in the back of the dial and move the dial assembly until a reading of 60 is obtained when the output frequency is 60 cycles. Tighten screws and then vary output until frequency is 180 cycles. Adjust 100 mmfd variable capacitor on bottom chassis until frequency and dial reading coincide.

Oscillator Distortion - This adjustment will have to be made if the 6 watt oscillator bulb is changed. Adjust R-68 for distortion of less than 1% at 20 cycles.

"Q" Meter Vacuum Tube Voltmeter - Adjust the mechanical zero with the power switch off and after a five minute warm-up make the following adjustments.

Short terminals 2 and 4 and connect a voltmeter of known accuracy across terminals 1 and 3. Open terminals 5 and 6 and set "Multiply By" switch (C) on the .01 position and adjust the gain setting of the oscillator until the standard voltmeter reads 10 volts. Set the "B" switch on 1 and adjust the full scale adjust on the rear of the chassis until the "Q" Meter indicates full scale. The "Multiply By" meter should also be adjusted to read 1 with the full scale adjust on the back of the chassis.

Now disconnect standard voltmeter and vary gain control observing both Q and Multiply By meters. They should track and the product with terminals 2 and 4 shorted should be a constant regardless of gain setting. A noisy tube in the input stages is the usual trouble if this tracking does not occur.

IF V-19, V-20 OR V-21 ARE TO BE REPLACED IT WILL BE NECESSARY TO READJUST R-105 LOCATED ON THE TOP OF THE AMPLIFIER CHASSIS. TO ADJUST CONNECT SCOPE OR VTVM TO TERMINAL 7 (REG. 180 VOLTS) AND ADJUST FOR MINIMUM HUM LEVEL. THIS SHOULD CORRESPOND TO 180 VOLTS D.C.

MAINTENANCE

THE ABOVE CALIBRATION SHOULD BE PERFORMED PERIODICALLY AND THE RELAY ON LOWER CHASSIS SHOULD BE CLEANED REGULARLY.

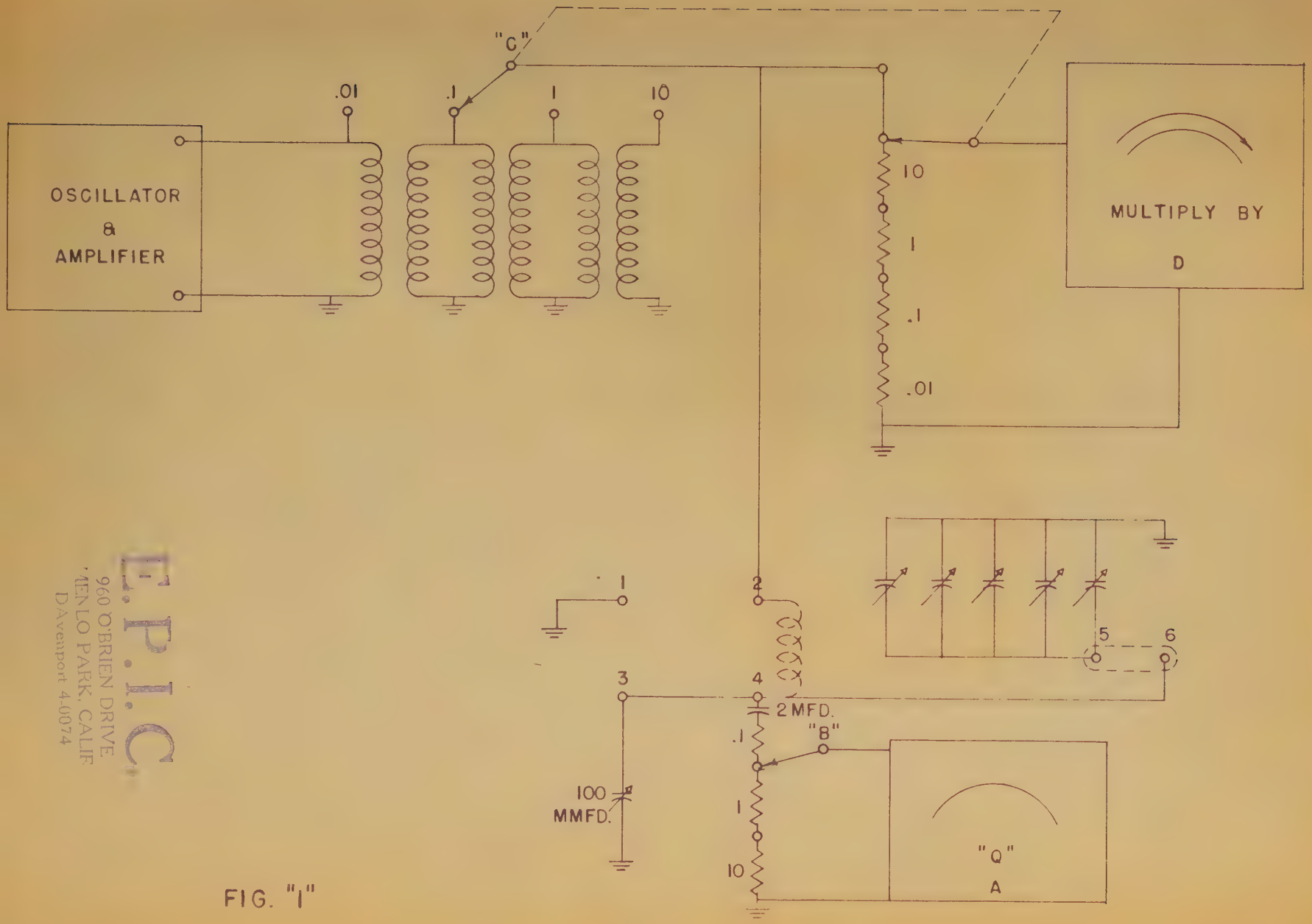
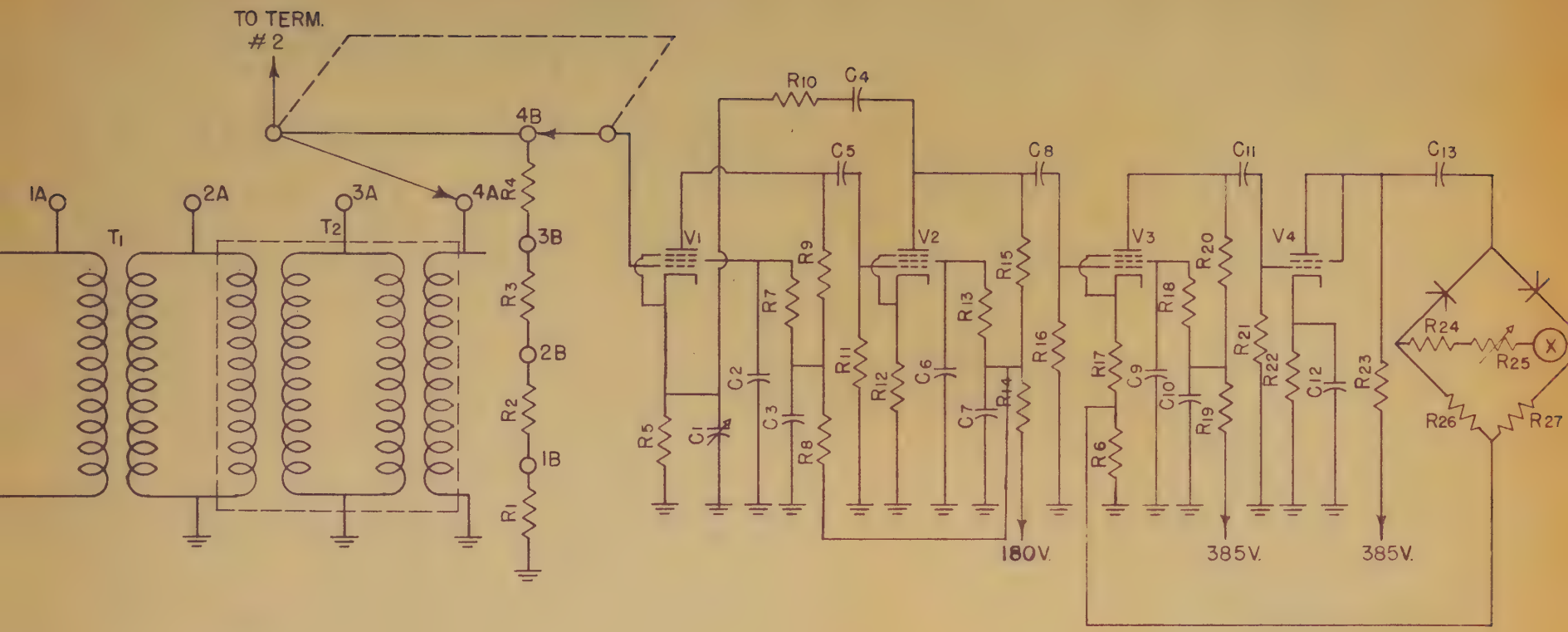
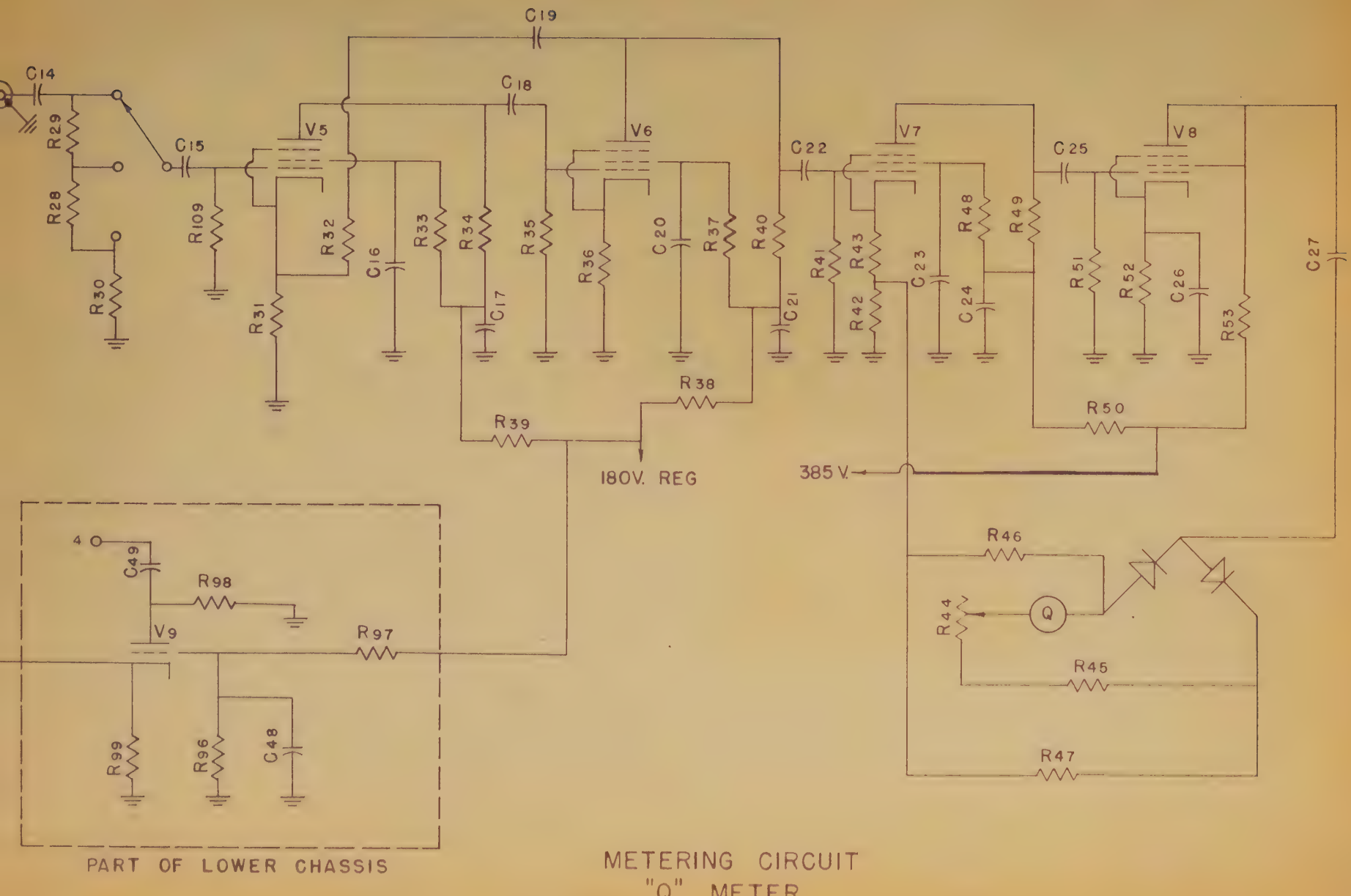


FIG. "1"

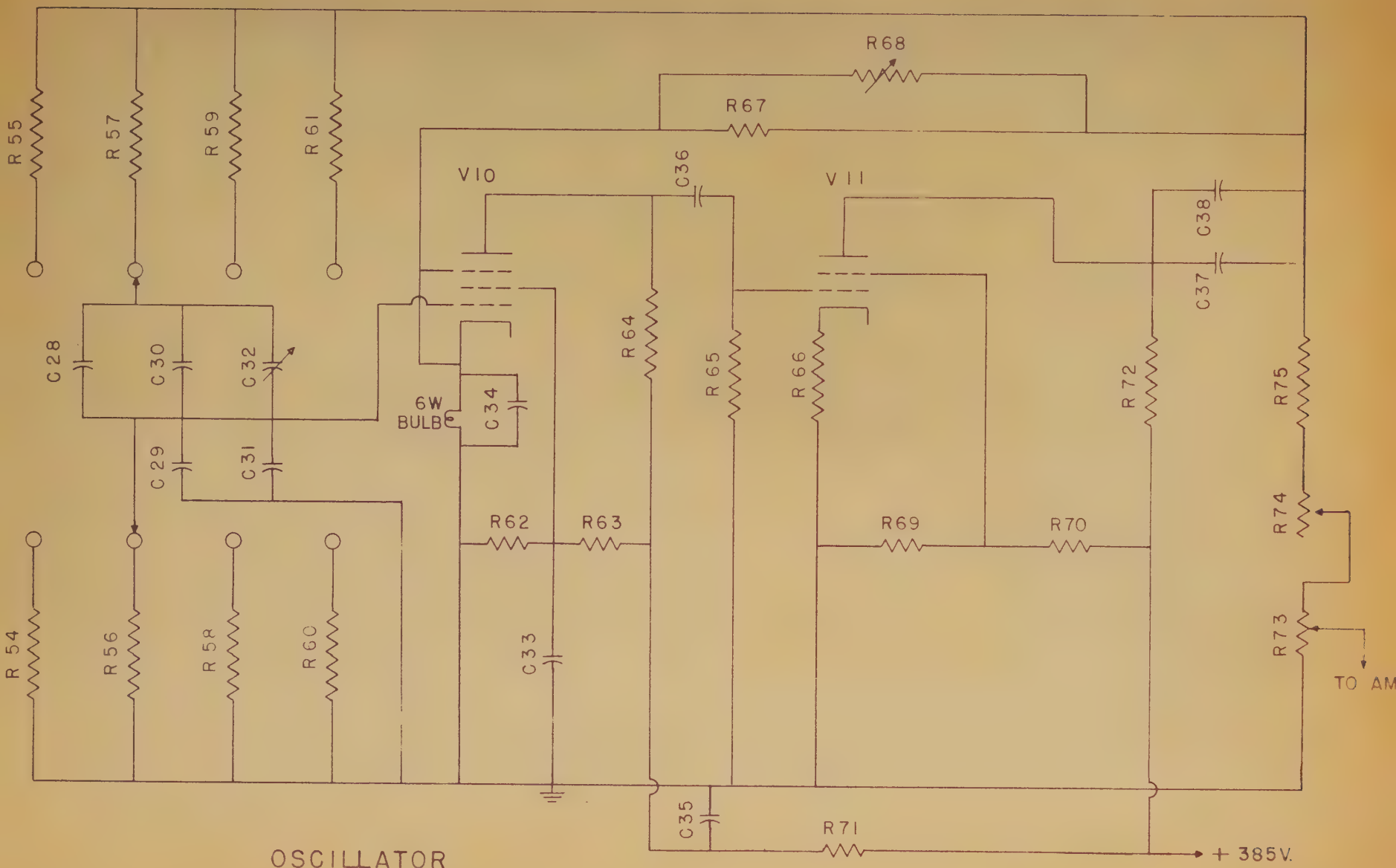
E.P.I.C.
960 O'BRIEN DRIVE
MENLO PARK, CALIF.
DAvenport 4-0074



METERING CIRCUIT FOR
MULTIPLY BY METER

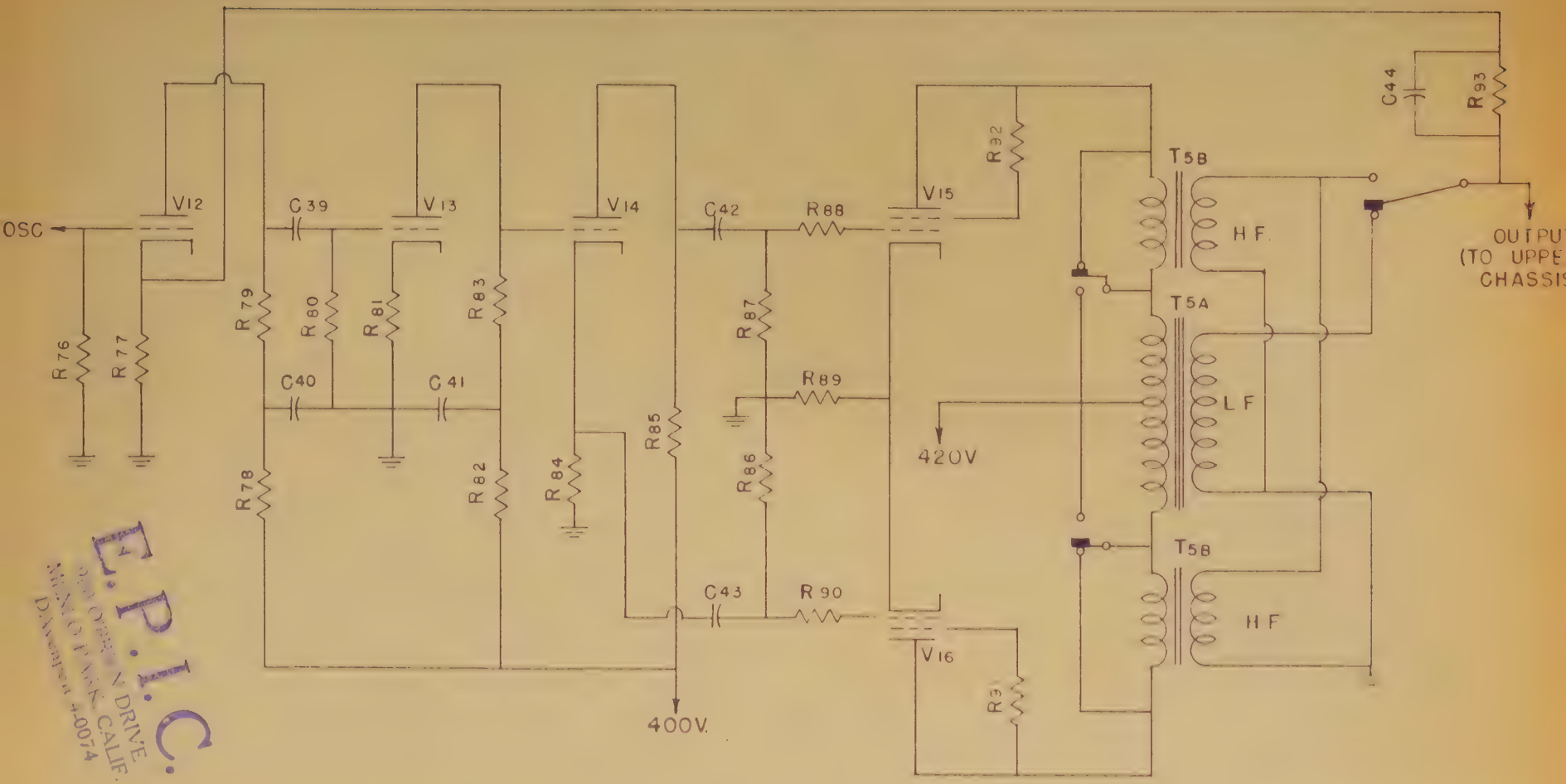


METERING CIRCUIT
"Q" METER



OSCILLATOR

1030-A "Q" METER



E.P.I.C.
1717 OTIS DRIVE
ALAMEDA, CALIF.
Phone LAkeside 4-0074

NOTE: R-84 & R-85 MUST BE
WITHIN 2% OF EACH OTHER.

POWER AMPLIFIER SECTION
1030-A "Q" METER

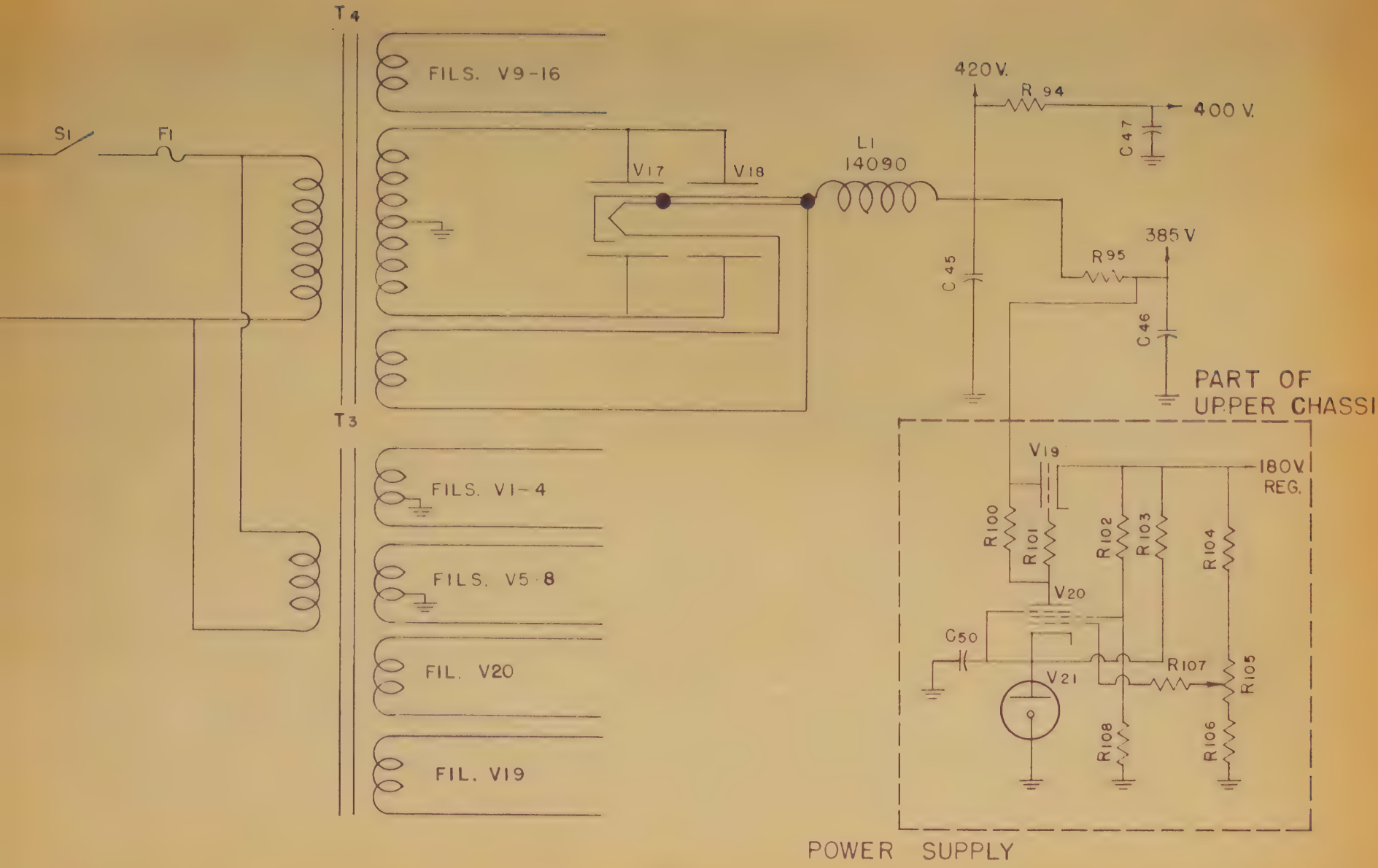

T4
FILS. V9-16
S1
F1
V17
V18
L1
14090
420V.
R 94
400 V.
C47
385 V
R95
C45
C46
PART OF
UPPER CHASSI
T3
FILS. V1-4
FILS. V5-8
FIL. V20
FIL. V19
V19
180V
REG.
R100
R101
R102
R103
R104
V20
C50
R107
R105
V21
R108
R106
POWER SUPPLY

TABLE OF VOLTAGE READINGS

TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8
V1 6AU6	0	1	HEATER	HEATER	100	45	1	
V2 6AU6	0	1	HEATER	HEATER	100	50	1	
V3 6AU6	0	1	HEATER	HEATER	210	100	1	
V4 6AQ5	0	7.3	HEATER	HEATER	110	110	0	
V5 6AU6	0	1.2	HEATER	HEATER	125	65	1.2	
V6 6AU6	0	.9	HEATER	HEATER	110	48	.9	
V7 6AU6	0	1	HEATER	HEATER	220	92	1	
V8 6AQ5	0	7	HEATER	HEATER	100	100	0	
V9 6C4	0		HEATER	HEATER		135	130	
V10 6SJ7	0	HEATER	3	0	3	85	HEATER	220
V11 6V6	0	HEATER	260	200	(	13	HEATER	13
V12 6J5	0	HEATER	135	280	0	400	HEATER	3.2
V13-14 6SN7	0	110	4	110	285	115	HEATER	HEATER
V15 5881	0	HEATER	410	410	0	0	HEATER	42
V16 5881	0	HEATER	410	410	0	0	HEATER	42
V17 5V4	0	HEATER		460 AC		460 AC	HEATER	
V18 5V4	0	HEATER		460AC		460AC	HEATER	440
V19 6C4	385	0	HEATER	HEATER	385	170	180	
V20 6AU6	78	85	HEATER	HEATER	170	162	85	
V21 5651		0			85			

ALL DC VOLTAGES MEASURED TO GROUND TO A 20,000 OHM/VOLT METER.
ALL AC VOLTAGES MEASURED TO GROUND TO A 1,000 OHM/VOLT METER.

PARTS LIST

RESISTORS

R-1	10 OHMS	1w	±1%
R-2	90 OHMS	1w	±1%
R-3	900 OHMS	1w	±1%
R-4	9K	1w	±10%
R-5	470 OHMS	1/2w	±10%
R-6	150 OHMS	1/2w	±10%
R-7	220K	1/2w	±10%
R-8	10K	1/2w	±10%
R-9	22K	1/2w	±10%
R-10	68K	1/2w	±10%
R-11	560K	1/2w	±10%
R-12	470 OHMS	1/2w	±10%
R-13	220K	1/2w	±10%
R-14	10K	1/2w	±10%
R-15	22K	1/2w	±10%
R-16	560K	1/2w	±10%
R-17	33 OHMS	1/2w	±10%
R-18	120K	1w	±10%
R-19	10K	2w	±10%
R-20	20K	2w	±10%
R-21	560K	1/2w	±10%
R-22	680 OHMS	1w	±10%
R-23	25K	5w	±10%
R-24	10K	1/2w	±10%
R-25	10K	2w	POTENTIOMETER
R-26	10K	1w	±10%
R-27	10K	1w	±10%
R-28	4.5K	1w	±10%
R-29	45K	1w	±1%
R-30	500 OHMS	1w	±1%
R-31	1000 OHMS	1/2w	±1%
R-32	47K	1/2w	±10%
R-33	220K	1/2w	±10%
R-34	10K	1/2w	±10%
R-35	560K	1/2w	±10%
R-36	470 OHMS	1/2w	±10%
R-37	220K	1/2w	±10%
R-38	10K	1/2w	±10%
R-39	10K	1/2w	±10%
R-40	22K	1/2w	±10%
R-41	560K	1/2w	±10%
R-42	150 OHMS	1/2w	±10%
R-43	33 OHMS	1/2w	±10%
R-44	10K	2w	POTENTIOMETER
R-45	10K	1/2w	±10%
R-46	10K	1w	±10%
R-47	10K	1w	±10%
R-48	120K	1w	±10%
R-49	20K	2w	±5%
R-50	10K	2w	±10%
R-51	560K	1/2w	±10%
R-52	680 OHMS	1w	±10%
R-53	25K	5w	±10%
R-54	8.4 MEG	1w	±1%

RESISTORS CONTINUED

R-55	8.4 MEG	1w	±1%
R-56	848K	1w	±1%
R-57	848K	1w	±1%
R-58	84.6K	1w	±1%
R-59	84.6K	1w	±1%
R-60	8.28K	1w	±1%
R-61	8.28K	1w	±1%
R-62	47K	2w	±10%
R-63	100K	2w	±10%
R-64	47K	1w	±10%
R-65	470K	1w	±10%
R-66	500 OHMS	10w	±5%
R-67	2.7K	1/2w	±10%
R-68	SELECTED AT TEST		
R-69	25K	5w	±10%
R-70	15K	10w	±10%
R-71	10K	5w	±10%
R-72	5K	25w	±5%
R-73	5K	2w	POTENTIOMETER
R-74	10K	2w	POTENTIOMETER
R-75	100K	2w	±10%
R-76	470K	1/2w	±10%
R-77	470 OHMS	1/2w	±10%
R-78	20K	2w	±10%
R-79	20K	2w	±10%
R-80	470K	1/2w	±10%
R-81	1.5K	1/2w	±10%
R-82	20K	1/2w	±10%
R-83	100K	2w	±10%
R-84	27K	1/2w	±2%
R-85	27K	1/2w	±2%
R-86	220K	1/2w	±10%
R-87	220K	1/2w	±10%
R-88	1000 OHMS	1/2w	±10%
R-89	400 OHMS	10w	±10%
R-90	1000OHMS	1/2w	±10%
R-91	100 OHMS	1/2w	±10%
R-92	100 OHMS	1/2w	±10%
R-93	27K	1/2w	±5%
R-94	1000 OHMS	2w	±10%
R-95	500 OHMS	10w	±10%
R-96	1 MEG	1/2w	±10%
R-97	4.7K	1/2w	±10%
R-98	100 MEG	2w	±1%
R-99	100K	1/2w	±10%
R-100	2.2 MEG	1/2w	±10%
R-101	1K	1/2w	±10%
R-102	22K	1/2w	±10%
R-103	62K	1/2w	±10%
R-104	100K	1/2w	±10%
R-105	20K	2w	POTENTIOMETER
R-106	68K	1/2w	±10%
R-107	1K	1/2w	±10%
R-108	220K	1/2w	±10%
R-109	1 MEG	1/2w	±10%

CAPACITORS

C-1	ADJUSTED AT TEST		
C-2	10 MFD	ELECTROLYTIC	450 VOLTS
C-3	10 MFD	ELECTROLYTIC	450 VOLTS
C-4	.22 MFD	PAPER	200 VOLTS
C-5	.1 MFD	PAPER	200 VOLTS
C-6	10 MFD	ELECTROLYTIC	450 VOLTS
C-7	10 MFD	ELECTROLYTIC	450 VOLTS
C-8	.1 MFD	PAPER	200 VOLTS
C-9	10 MFD	ELECTROLYTIC	450 VOLTS
C-10	10 MFD	ELECTROLYTIC	450 VOLTS
C-11	.1 MFD	PAPER	400 VOLTS
C-12	10 MFD	ELECTROLYTIC	20 VOLTS
C-13	2 MFD	BATHTUB	600 VOLTS
C-14	2 MFD	BATHTUB	600 VOLTS
C-15	.1 MFD	PAPER	200 VOLTS
C-16	10 MFD	ELECTROLYTIC	450 VOLTS
C-17	10 MFD	ELECTROLYTIC	450 VOLTS
C-18	.1 MFD	PAPER	200 VOLTS
C-19	.056 MFD	PAPER	200 VOLTS
C-20	10 MFD	ELECTROLYTIC	450 VOLTS
C-21	10 MFD	ELECTROLYTIC	450 VOLTS
C-22	.1 MFD	PAPER	200 VOLTS
C-23	10 MFD	ELECTROLYTIC	450 VOLTS
C-24	10 MFD	ELECTROLYTIC	450 VOLTS
C-25	.1 MFD	PAPER	400 VOLTS
C-26	50 MFD	ELECTROLYTIC	50 VOLTS
C-27	2 MFD	BATHTUB	600 VOLTS
C-28	FREQUENCY DETERMINING CAPACITOR		
C-29	FREQUENCY DETERMINING CAPACITOR		
C-30	FREQUENCY DETERMINING CAPACITOR		
C-31	FREQUENCY DETERMINING CAPACITOR		
C-32	75 MMFD	TRIMMER	
C-33	.01 MFD	SILVER MICA	400 VOLTS
C-34	SELECTED AT TEST		
C-35	3 X 15 MFD	ELECTROLYTIC	450 VOLTS
C-36	.25 MFD	OIL FILLED	600 VOLTS
C-37	.1 MFD	PAPER	600 VOLTS
C-38	8 MFD	ELECTROLYTIC	450 VOLTS
C-39	.1 MFD	PAPER	400 VOLTS
C-40	15 MFD	ELECTROLYTIC	450 VOLTS
C-41	15 MFD	ELECTROLYTIC	450 VOLTS
C-42	.1 MFD	PAPER	400 VOLTS
C-43	.1 MFD	PAPER	400 VOLTS
C-44	27MMFD	MICA	200 VOLTS
C-45	15, 15 MFD	ELECTROLYTIC	500 VOLTS
C-46	15 MFD	ELECTROLYTIC	500 VOLTS
C-47	15 MFD	ELECTROLYTIC	500 VOLTS
C-48	8 MFD	ELECTROLYTIC	400 VOLTS
C-49	.003 MFD	MICA	400 VOLTS
C-50	.01 MFD	MICA	400 VOLTS

TRANSFORMERS

T-1	MATCHING TRANSFORMER FREED # 14560
T-2	MATCHING TRANSFORMER FREED # 14561
T-3	FILAMENT TRANSFORMER FREED # 14562A
T-4	POWER TRANSFORMER FREED # 23149
T-5	OUTPUT TRANSFORMER FREED # 25986

INDUCTORS

L-1	FILTER CHOKE FREED # 14090

MISCELLANEOUS

F-1	3AG 3 AMP. FUSE
S-1	S.P.S.T. 3 AMP. 250V. SWITCH

GE LAMP 6W 120 VOLTS S6 TYPE

E.P.I.C.
960 O'BRIEN DRIVE
MENLO PARK, CALIF.
DAvenport 4-0074

www.manualsplus.com
1025677